Navigating FDOT Specifications and Standards

And How They Apply To Precast Concrete Pipe And Box Culverts
Important FDOT Documents…

• Special Provisions
• Technical Special Provisions
• Engineering plans
• Roadway Standard Indices
• Developmental Specifications
• Supplemental Specifications
• Standard Specifications
Additional FDOT Documents…

- Structures Design Guide
- Qualified Products List (QPL)
- Materials Manual
- Plant Quality Control Plan

Developed by plants
Subject to FDOT review / approval
Training Objectives

- Not to memorize every specification
- Focus on resources
- Learn where to find answers
- Reference
- Note: Always be familiar with contract document requirements of your job
FDOT State Specifications Office

Web Site

http://www.dot.state.fl.us/specificationsoffice/

Standard Specifications for Road and Bridge Construction (2007)

Other Versions May Govern Your Job

Specification Modifications / Workbooks

Qualified Products List (QPL)

http://www.dot.state.fl.us/specificationsoffice/QPLindex.htm
FDOT Specification Terms

Section ###

FDOT specifications are referred to as “Sections” and have a numeric designation.

Example, “Section 430.”

“Contractor” – Individual, firm, joint venture, or company contracting with Dept. to perform work.
Is your company considered a “contractor” when it provides pipe for a FDOT project?

Legally, the prime contractor is the installer / contractor. FDOT is contracted with the contractor / installer. The pipe/box plant is considered to be a sub-contractor.

However, there are many references to “contractor” in the pipe/box specs. There references are directed toward the manufacturer.
FDOT Specification Terms (Continued)

• “Engineer” – FDOT Office of Construction of representative.
• “Engineer of Record” – FDOT staff engineer or contracted consultant responsible for project’s concept, analysis, and Plans and Specifications.
• “Inspector” – Authorized representative of the Engineer to make official inspections of materials and work of the contractor.
FDOT Specification Terms (Continued)

• “Materials” – Any substances incorporated in the contracted work.
• “Specialty Engineer” – Florida P.E. that designs a special component of the work. May be employee of the Contractor or fabricator, of a supplier to a fabricator, or an independent consultant.
FDOT Specification Terms (Continued)

• “Standard Specifications” – Applicable to all Contracts.
• “Supplemental Specifications” – Approved additions / revisions, applicable to all Contracts.
FDOT Specification Terms (Continued)

• “Special Provisions” – Specific clauses adopted by FDOT to revise Standard / Supplemental Specs, applicable to specific projects.

• “Technical Special Provisions” – Specs prepared outside the State Spec. Office, technical in nature, applicable to specific projects.

• “Developmental Specification” – Spec. that is developed based on a new process or material.
FDOT Specification Office Website
http://www.dot.state.fl.us/specificationsoffice/
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<th>Description</th>
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</tr>
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</table>
Specifications Often Change

Changes Published in “Workbooks”

Released in January and July

Mandatory Revisions

Proposed Spec. Modifications

Subscribe to FTBA News for Announcements

Designate Someone to Monitor Spec. Changes

FTBA News [news@FTBA.com]
Key RCP Specifications (FDOT)

Steel Reinforced Concrete Pipe (RCP)

• Section 430: Pipe Culverts and Storm Sewers (all pipe materials)
• Section 443: French Drains (slotted pipe)
• Section 449: Precast Concrete Drainage Products (RCP and FRCP)
• Section 942: Pipe Gaskets
Section 449

SECTION 449

PRECAST CONCRETE DRAINAGE PRODUCTS

449-1 Description.
Obtain precast drainage products from a qualified precast concrete drainage products plant. Precast concrete drainage products are also called products, may include but is not limited to, round sewer pipe, precast concrete pipe, manholes, manholes, culverts, bottomless, and precast concrete cross sections, and precast concrete tee collectors.

Ensure that all precast drainage products are designed and manufactured in accordance with the specifications of the contract documents.

A precast concrete drainage product, herein called a product, is an independent operating facility capable of all operations necessary to fabricate, store, and transport products. Each qualified product plant is required to have an approved Quality Control Program (QCP) meeting the requirements of Section 448.

Obtain precast concrete pipe from a plant that is currently on the Department's list of qualified precast drainage products that meet the requirements of Section 6.5.1 of the Materials Manual, which is available at the following URL:
http://www.dot.state.co.us/forms/internationalmanuals/section6.pdf

Obtain precast drainage products from a plant that is currently on the Department's list of qualified precast drainage products that meet the requirements of Section 6.5.1 of the Materials Manual, which is available at the following URL:
http://www.dot.state.co.us/forms/internationalmanuals/section6.pdf

449-2 Materials.
Ensure that the materials used for the construction of the precast drainage products have a certification statement from the source, showing that they meet the applicable requirements of the specifications with the following requirements:

649-5 Construction Requirements.
Unless otherwise stated within the contract documents, all construction shall conform to the following requirements.

Concrete and Soil:
- Compact soil to a minimum density of 95% of theoretical maximum density.
- Use a compacting tool to compact the soil to the required density.
- Use a compaction tool to compact the soil to the required density.
- Use a compaction tool to compact the soil to the required density.
- Use a compaction tool to compact the soil to the required density.

649-6 Reinforced Concrete Pipe:
- Reinforced concrete pipe shall be in accordance with the requirements specified in the contract documents.
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649-7 Steel Reinforced Concrete Pipe:
- Steel reinforced concrete pipe shall be in accordance with the requirements specified in the contract documents.
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649-8 Prestressed Concrete Pipe:
- Prestressed concrete pipe shall be in accordance with the requirements specified in the contract documents.
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Key RCP Materials Specs (FDOT)

• Section 901: Coarse Aggregate
• Section 902: Fine Aggregate
• Section 921: Portland Cement and Blended Cement
• Section 923: Water
• Section 924: Admixtures
• Section 929: Pozzolans and Slag
• Section 942: Gasket Material
• Section 415: Reinforcing Bar
Other Key RCP Specifications: ASTM and AASHTO

Cementitious

AASHTO M85: Portland Cement
ASTM C 618: Fly Ash

Steel Reinforcement

ASTM A185 and A497: Welded Wire Reinforcement
ASTM A82, A496, or A615: Wire for Site Cage Machines

RCP Design, Fabrication, Performance

ASTM C76 (round pipe)
ASTM C507 (elliptical pipe)
Key RCB Specifications (FDOT)

Precast Reinforced Concrete Box Culverts (RCB)

Section 410: Precast Concrete Box Culvert
Section 407: Three-sided Precast Culverts

Concrete

Section 346: Portland Cement Concrete Reinforcing Steel

Section 415: Reinforcing Steel
Key Precast RCB Specifications: and AASHTO

Precast RCB Design and Fabrication
ASTM C1433 / C1577 (not referenced by FDOT)

Joints
ASTM C990

Reinforcing Steel
ASTM A82, A496, or A615: Wire for Site Cage Machines
ASTM A185, A497: Welded Wire Reinforcement

Similar ASTM / AASHTO Specifications As Required For Concrete Pipe
FDOT State Materials Office

Web Site

http://www.dot.state.fl.us/statematerialsoffice/

Material Producer List


Materials Manual

http://www.dot.state.fl.us/statematerialsoffice/administration/resources/library/publications/materialsmanual/index.htm
FDOT State Materials Office Website
http://www.dot.state.fl.us/statematerialsoffice/

Link to Approved Producer List and Materials Manual

District Contacts
Qualified Producer Lists

State Materials Manual


Concrete Pipe

Box Culverts

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<td>Flexible Pipes (Metal and Plastic)</td>
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<tr>
<td><strong>Section 7.1 - Effective 3/16/00, Revision 6/22/01</strong></td>
</tr>
<tr>
<td>Inspection of Timber Products</td>
</tr>
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Quality Control
VOLUME I

SECTION 6.2

QUALITY ASSURANCE PROGRAM OF PRECAST CONCRETE PIPE

6.2.1 PURPOSE

This procedure provides guidance to the Florida Department of Transportation personnel related to the development and implementation of the quality control and quality assurance programs for the manufacture, storage, and transportation of the precast concrete pipe for the Florida Department of Transportation projects.
6.2.5 GENERAL INFORMATION

The Precast Concrete Pipe Plants (Plants) produce, inspect, store, and ship Precast Concrete Pipe (Pipe) meeting the requirements of the Specifications and other Contract Documents. The District Materials Offices verify that manufactured Pipe conforms to the requirements of the Contract Documents. The District Materials Office accepts (approves) their quality control plans and inspects the plants prior to commencement of any work.
Section 6.2
Plant Qualification Review Process

Plant submits proposed QC Plan
District Materials Office Review

Manufacturing
Quality Control Testing
Inspections and Documentation
Forming, Steel Placement
Storage and Shipping

Approval – “A” on Qualified Producer List
Maintaining Quality Control Plan and Plant Qualification Status

Annual plant qualification reviews

Test data representing all pipe diameters

Submit any changes to QC Plan

Materials Manual, Section 5.6

Quality Control Program
Volume II

Section 6.2

PRECAST CONCRETE PIPE

6.2.1 PURPOSE

This procedure provides guidance for the development and implementation of the quality control program for the manufacture, storage, and transportation of the precast concrete pipe (Pipe) for the Florida Department of Transportation projects. The Pipe may include, but are not limited to, round concrete pipe, elliptical concrete pipe, mitered end sections, and underdrain pipe.
VOLUME I

Section 6.3

QUALITY ASSURANCE PROGRAM OF PRECAST CONCRETE BOX CULVERTS AND DRAINAGE STRUCTURES

6.3.1 PURPOSE

This procedure provides guidance to Department personnel related to the implementation of the quality control and quality assurance programs for precast concrete box culverts and drainage structures (Structures).
VOLUME II

Section 6.3

PRECAST CONCRETE DRAINAGE STRUCTURES AND BOX CULVERTS

6.3.1 PURPOSE

This procedure provides guidance for the development and implementation of the quality control for the manufacture, storage, and transportation of the precast concrete drainage structures and box culverts (Structures) for the Florida Department of Transportation projects. The Structures may include, but are not limited to, inlets, manholes, junction boxes, endwalls, three-sided precast concrete culverts, and precast concrete box culverts.

The Department will perform periodic quality assurance inspections, sampling, and testing to ensure of the quality and acceptability of the materials, methods, techniques, procedures and processes being utilized by the manufacturer in the fabrication of precast concrete products. The quality assurance inspection and testing will be performed in accordance with Section 6.3. Volume I. of the Materials Manual.
FDOT Roadway Design Office
Web Site
http://www.dot.state.fl.us/rddesign/default.htm
State Drainage Office
Oversees all Pipe Issues
Excluding Box Culverts (Structures)
Welcome to the State Roadway Design Office

David O'Hagan, P.E., State Roadway Design Engineer
Email: David.OHagan@dot.state.fl.us

Our Mission
To develop and provide policy, procedures, criteria and standards for design of Florida Roadways, monitor their implementation, and provide training.

Our Vision
Provide excellence in the products, services, and information we deliver to our customers.

Our Values
Teamwork, Respect, Accountability, Integrity, Leadership, Service

Roadway Topics
- FDOT Homepage
- Design Build
- Design Standards
- District Design Newsletters
- Drainage

The Office of Roadway Design is an integral part of the Florida Department of Transportation. Our office is located at 605 Suwannee Street Mail Station 32 Tallahassee, Florida 32399-0450.

If you should have any questions, comments or suggestions regarding our website or the Office of Roadway Design, you can contact us via email link or call us at (850) 414-4310.

There is a new number that can be used for faxes sent by E-mail. The number is (850) 412-8044.

The new fax numbers for the office fax machine are (650) 414-5261
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<td>Cross Drain Mitered End Section</td>
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<td>Side Drain Mitered End Section</td>
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<td>Miscellaneous Drainage Details</td>
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<td>Concrete Pavement Subdrainage</td>
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Key RCP Standard Indices

Index 299 – Geotextile Material
  D-3 Filter Fabric Standard Criteria
Index 205 – Cover Height
  Pipe Class and D-Loads
Index 270 – Flared Ends
Indices 272 / 273 – Mitered Ends
Key RCP Standard Indices

Index 280 – Misc. Details

  Joint Designs
  RCP – CMP Jackets
  Integral Manhole Risers

Index 285 – French Drains

Slotting Schedule
Precast Box Culvert
Key Standard Indices

Index 290 – Box Culvert Details
Index 291 – Supplemental Details
  Joint Details
  Connections to CIP Headwalls
Index 292 – Standard Steel Design
  Release January 2007
  Steel tables similar to ASTM Standards
FDOT Structures Design Office

Web Site

http://www.dot.state.fl.us/structures/default.htm

Oversees precast box culvert issues

Does not oversee pipe issues

Structures Manual


Concrete and Environment
FDOT requires thicker concrete cover over the steel in precast RCB.

ASTM C1433 requires 1 inch cover.

FDOT requires 2 inches cover minimum and Requires 3 inches in “Extremely Aggressive” environments.

Ref. Table 1.2 (Concrete Cover), Structures Manual.
RCB concrete mix design properties are based on FDOT Section 346 and the Environmental Classification.

Refer to Table 1.3 (Structural Concrete Class Requirements), Structures Manual.

In “Moderately Aggressive” environments, Class IV concrete is to be used at a minimum.
1.4 Concrete and Environment [5.12.1]

1.4.1 Cover

Delete AASHTO LRFD 5.12.3 and substitute the following requirements:

A. The requirements for concrete cover over reinforcing steel are listed in Table 1.2. Examples of concrete cover are shown in Figures 1.2 through 1.5.
B. When deformed reinforcing bars are in contact with other embedded items such as post-tensioning ducts, the actual bar diameter, including deformations, must be taken into account in determining the design dimensions of concrete members.

Table 1.2 Concrete Cover

<table>
<thead>
<tr>
<th>Concrete Cover (inches)</th>
<th>S or M</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superstructure (Precast)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internally and externally (except for the surfaces):</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Top surface of girder top flange:</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Top deck surface: (Short Bridges)**</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Top deck surface: (Long Bridges)**</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>All components and surfaces not included above (including barriers):</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Superstructure (Cast-in-Place)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All external and internal surfaces (ex. top surfaces):</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Top deck surface: Short Bridges*</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Top deck surface: Long Bridges*</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Substructure (Precast and Cast-in-Place)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>External surfaces cast against earth and surfaces in contact with water:</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Ext. formed surfaces, columns, and tops of footings not in contact with water:</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Substructure (Precast):</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Prestressed Piling (including cylinder piling):</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Dropped shaft and auger cast piles:</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Retaining Walls (Cast-in-Place or Precast) (Excluding MSE walls)*:</td>
<td>2</td>
<td></td>
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<tr>
<td>Culverts (Cast-in-Place or Precast)*:</td>
<td>2</td>
<td></td>
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<tr>
<td>Bulkheads:</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

*S = Slightly Aggressive; M = Moderately aggressive; E = Extremely Aggressive.
**Cover dimension includes a 0.5-inch allowance for milling.
1- See Short & Long Bridge Definitions in Chapter 4.
3- See SDG 3.13 for MSE wall cover requirements.
### Table 1.3 Structural Concrete Class Requirements

<table>
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<tr>
<th>CONCRETE LOCATION AND USAGE</th>
<th>ENVIRONMENTAL CLASSIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SUPERSTRUCTURE</strong></td>
<td></td>
</tr>
<tr>
<td>Cast-in-Place (other than Bridge Decks)</td>
<td>Class II</td>
</tr>
<tr>
<td>Cast-in-Place Bridge Deck (Including Diaphragms)</td>
<td>Class IV</td>
</tr>
<tr>
<td>Approach Slabs</td>
<td></td>
</tr>
<tr>
<td>Precast or Prestressed</td>
<td>Class IV, V, or VI</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SUBSTRUCTURE</strong></td>
<td></td>
</tr>
<tr>
<td>Cast-in-Place (other than Bridge Seals)</td>
<td>Class II</td>
</tr>
<tr>
<td>Precast or Prestressed (other than piling)</td>
<td>Class IV, V, or VI</td>
</tr>
<tr>
<td>Cast-in-Place Columns located directly in splash zone</td>
<td>Class II</td>
</tr>
<tr>
<td>Piling</td>
<td>Class IV (Spec.) or VI</td>
</tr>
<tr>
<td>Drilled Shafts</td>
<td>Class IV (Drilled Shafts)</td>
</tr>
<tr>
<td>Retaining Walls</td>
<td>Class II or III</td>
</tr>
</tbody>
</table>

Corrosion Protection Measures: Calcium nitrite and/or silica fume admixtures may be required. Admixture use must conform to the requirements of “Concrete Class and Admixtures for Corrosion Protection.”

### 346-2.2 Types of Cement

Unless a specific type of cement is designated elsewhere, use Type I, Type IP, Type IS, Type IP (MS), Type II, or Type III cement in all classes of concrete. Use only the types of cements designated for each environmental condition in structural concrete. A mix design for a more aggressive environment may be substituted for a lower aggressive environmental condition.

<table>
<thead>
<tr>
<th>BRIDGE SUBSTRUCTURE, DRAINAGE STRUCTURES AND OTHER STRUCTURES</th>
<th>Slightly Aggressive Environment</th>
<th>Moderately Aggressive Environment</th>
<th>Extremely Aggressive Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Component</td>
<td>Type I or Type III</td>
<td>Type I with Fly Ash and/or Slag, Type II, Type IP, Type IP (MS), or Type IS</td>
<td>Type II with Fly Ash or Slag</td>
</tr>
<tr>
<td>All Elements</td>
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Portland Cement
FDOT Requires AASHTO M85

ASTM C150 permits up to 5% limestone addition, a 1% process addition, and has no cap on C3S.

AASHTO M85 allows only a 1% process addition and has a maximum C3S cap of 58%.

At this time, ASTM C150 and AASHTO M85 cement have different properties.

AASHTO and ASTM are coordinating to harmonize the specifications.
Environment and Cement Type

All AASHTO M85 Type II meets M85 Type I.

If your mill cert states “M85 Type I/II” that would imply that it meets M85 Type II and would therefore be acceptable for FDOT Class IV extremely aggressive concrete.

If your mill cert states only “ASTM C150 I/II” it likely will not meet AASHTO II.

Not all Class IV concrete requires AASHTO M85 Type II cement - only those in an extremely aggressive environment.

M85 Type I may be used in moderately aggressive environments.
Environment Classification

Effects Precast Box Culvert Designs

Concrete Cover Thickness
Concrete Type and Mix Properties
Cement Type
Summary

• Know How to Find Specs and Standards
• FDOT Web Site
• Read the Specs
• Understand the Specs
• Do not assume specs are the same for all projects – check contract documents